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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

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TITLE

A PRELIMINARY ANALYSIS OF PINE-BEETLE HAZARD CONDITIONS IN THE DESCHUTES SUBREGION, OREGON

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FOREWORD

For the past several years the Division of Forest Insect Investigations of the Bureau of Entomology and Plant Quarantine has given attention to the solving of the beetle hazard problem. Work under way at both the Berkeley and Portland Forest Insect Laboratories has already reached the point where preliminary answers can be given, and areas can be zoned as to beetle risk on the basis of recognizable conditions.

The present report gives the results of a preliminary analysis of bark beetle hazard conditions in the Deschutes Subregion of central Oregon, and includes a hazard map which was prepared as a result of these studies. The methods employed are described in detail in a previous report by the writer entitled, "An Approach to the Problem of Determining Pine-Beetle Hazard in Ponderosa Pine Forests of Oregon and Washington," dated July 29, 1939. The methods developed are briefly described in this report.

THE PINE BEETLE HAZARD PROBLEM IN THE DESCHUTES SUBREGION

For the past decade pine beetles have taken a heavy toll of mature and overmature ponderosa pine on the Deschutes National Forest and adjacent private timberlands of central Oregon. Estimates from annual pine beetle surveys show that on an area of 1,161,000 acres carrying a ponderosa pine volume of 10,417,000 M. bm. gross losses from pine beetles in the last decade (1931 to 1940) have totaled 895,000 M. bm. or approximately 77 board feet per acre per year.

The distribution of this loss has been very unequal. Portions of the Cabin Lake and Sisters working circles have been hard hit with losses exceeding 30 percent of the stand during the last decade. Other portions, such as the upper Deschutes River basin between the Cascades and the Paulina Mountains, have had low losses, in some cases not in excess of 2.5 percent of the stand in 10 years, which is considerably less than the estimated growth replacement.

This condition of variable hazard from pine beetles appears to be typical of ponderosa pine stands. In recent years, considerable study has been given to the problem of determining why such differences occur and in developing methods for predicting the future hazards of ponderosa pine areas.

With even a rough approximation of the relative hazards of different areas within a management unit or forest working circle, it is possible to develop logging plans so as to cut high risk areas ahead of those showing low risk of beetle attack and thus salvage trees which otherwise would soon become a total loss.

Basis for Hazard Zoning

In order to have such an appraisal of the pine beetle hazards of the Deschutes subregion, this preliminary analysis has been prepared.

The hazard map accompanying this report was prepared by combining and interpreting two sets of basic data compiled on two preliminary maps. The first of these was a map showing life zone and stand conditions and the second a map of actual beetle loss sustained during the past 10 to 20 years.

The stand condition map was prepared on a transparent overlay sheet, using the Forest Resource Survey's lithographed type maps on 1/4-inch-to-the-mile scale as a basis. On this map the following four factors were combined by means of cross-hatching, with light to heavy lines indicating the relative hazard of each factor:

(1) Forest type. Running from low hazard in the upper slope mixture with balsam fir to high hazard in the fringe type where ponderosa pine is mixed with juniper.

(2) Site quality. As site quality drops, hazard is considered as increasing. (Sites II and III, low hazard; Site IV, medium; and Sites V and VI, high hazard.)

(3) Elevation. Stands were rated according to elevation, with low hazard at high elevation and high hazard at the lower edge of the pine belt.

(4) Volume per acre. Unless recent beetle epidemics, fires, windfalls, or logging have been operative on the area, volume per acre usually expresses the growth capacity of the site and whether or not it is favorable to pine growth, hazard was rated high in stands of low volume and low in stands of heavy volume.

The combination of these four factors on the overlay map served to indicate in what portions of the area all factors combined to make for low or high hazard, and what portions were indeterminate in character. This map might be considered as the theoretical picture of hazard conditions on the basis of the above assumptions.

On the second overlay map, prepared on the same scale as the first, was compiled the consolidated information from six different surveys made by the Forest Service and Bureau of Entomology and Plant Quarantine in which snag counts were made on strips and plots and the entire area mapped as to intensity of beetle infestation. This map showed what beetle damage had actually occurred in different parts of the Deschutes Subregion during the period 1927-1936.

On putting these two overlay maps together, the agreement between the distribution of hazardous stand conditions and the actual beetle damage which had taken place during the last two decades was very striking. This made possible the preparation of a third overlay combining and interpreting these conditions to give an indication of future hazard.

Pine-Beetle Hazard Map

The pine-beetle hazard map, attached to this report and prepared in the manner described above, shows in a relative way where losses may be expected to occur during the next 10 to 20 years. How much loss will take place is, of course, dependent upon climatic conditions and beetle population to a large extent. But if losses do occur, they can be expected to hit the more hazardous areas harder than those of low hazard. Any prediction as to the amount and distribution of future losses necessarily must be based upon certain assumptions. The assumptions in the present case were as follows:

(1) For the next 10 years (1941-1950) the bark-beetle hazard to ponderosa pine stands will not be radically different from that prevailing during the past decade (1931-1940), except that

(2) As stands become badly depleted through repeated beetle attacks, there will be a gradual shift of losses into stands of lower hazard rating where a great number of overmature, highly susceptible trees may still be found.

(3) Stands which have been badly depleted and now show improved growth rate of the surviving stand and a recent reduction in loss rate can be given a lower hazard rating because they no longer contain sufficient volume of susceptible host material to support an epidemic. In extreme cases, such stands fall in the same category as cut-over or badly fire-killed areas. The probable amount of loss, while dependent upon beetle population and climatic conditions, can be assumed as approximating that for the past two decades in stands of similar composition and risk. This means that since the highest risk areas have been badly depleted of susceptible trees, future losses in remaining stands will proceed at a somewhat lower rate.

On the basis of these assumptions, the basic data of stand conditions and past losses were modified to show five degrees of future hazard; i.e., very low, low, medium, high, and very high. These five divisions were defined as follows:

(1) Very low hazard. Cut-over-burned, or badly bug-killed areas or young stands where appreciable net growth can be expected.

(2) Low hazard. Thrifty mature stands where losses and growth are approximately in balance. Probable gross loss in a 10-year period not exceeding 7 percent of the volume of the stand.

(3) Medium condition. Mature to overmature stands where losses exceed growth by a small margin, depleting mature stand over a natural rotation of about 300 years. Probable gross loss varying between 8 and 15 percent of the stand in a 10-year period.

(4) High hazard. Overmature stands where losses are approximately double the growth rate. Probable gross loss between 15 and 20 percent of the volume of the stand in 10 years.

(5) Very high hazard. Overmature, decadent stands where losses are more than double the growth rate and rapidly depleting the reserve. Probable gross loss exceeding 20 percent of the volume in 10 years.

Beetle Hazard by Areas

Sisters Area

As the accompanying hazard map shows, the largest block of high hazard timber involves private timber lands north and south of Sisters, Oregon, in Ranges 10 and 11 East, T. 11 S. to T. 17 S., inclusive. Most of this timber is owned by Brooks-Scanlon, Hill, Johnson, and Gilchrist. Through exchange agreements some of it is now being transferred to Forest Service jurisdiction.

While logging is progressing at a fairly rapid rate in this area, a great deal of future loss could be salvaged through application of a sanitation-salvage cutting ahead of the main logging job, taking out from 15 to 20 percent of the stand volume in the most susceptible trees. Experimental beetle control operations of this character on a number of operations in northern California and southern Oregon are showing encouraging results.

Cabin Lake Area

Practically all of the timber in this area which lies on the eastern and southern slopes of the Paulina Mountains is either National Forest timber or is owned by the Shevlin-Hixon Company.

A number of years ago the Forest Service recognized the high hazard character of their timber lands in the extreme eastern portion of the Cabin Lake area and took steps to direct cutting operations into this area to salvage potential loss. Most of the high hazard areas have now been logged, principally on a thrift and maturity marking basis in which the poorest risk and all the overmature trees on the area were removed. This resulted in a cut of approximately 50 to 55 percent of the stand volume and has left a highly resistant reserve stand which should assure restocking and continuous forest production on this area.

The lands of the Shevlin-Hixon Company present a low to moderate beetle hazard, and for the most part losses are not high enough to justify an advance sanitation-salvage cutting. These lands are now being cut rather rapidly, either on a heavy cut basis or under an exchange agreement with the Forest Service in which about one-third of the thriftiest trees and 45 percent of the volume are being left as a reserve.

Crescent Area

The entire Crescent Area, the upper Deschutes River drainage between the Paulina Mountains and the Cascades, is a cold basin in which beetle losses have been low and future hazard is either low or moderate. Cutting in this area could well be delayed until more hazardous areas have been cut or salvaged.

The Gilchrist Company is one of the largest private owners in this area and their logging operations are proceeding at a fairly rapid pace in timber of low to moderate hazard. The Shevlin-Hixon Company also owns a large block of timber in this area.

Taking the Deschutes subregion as a whole through past cutting operations and natural immunity most of the subregion presents at present a low hazard of beetle damage. The eastern portion of the Sisters area is the one exception, where high losses can be expected until present highly susceptible stands have been removed through logging operations, or until all the most susceptible trees in the stand have been killed.

DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT INVESTIGATIONS

PINE BEETLE HAZARD ZONATION
DESCHUTES SUBREGION

SCALE 1 INCH = 4 MILES

- VERY LOW HAZARD
  CUTOVER, BURNED OR BADLY BUG-KILLED AREAS
- LOW HAZARD
  PROBABLE LOSS FROM 0 TO 7 PERCENT IN 10 YEARS
- MODERATE HAZARD
  PROBABLE LOSS FROM 8 TO 15 PERCENT IN 10 YEARS
- HIGH HAZARD
  PROBABLE LOSS FROM 15 TO 20 PERCENT IN 10 YEARS
- VERY HIGH HAZARD
  PROBABLE LOSS 20 PERCENT AND OVER IN 10 YEARS
- NON-TIMBERED AREAS
- NATIONAL FOREST BOUNDARIES

FOREST INSECT LABORATORY
PORTLAND, OREGON

AUG. 7, 1939

122° 00'
121° 00'
44° 00'
R.7E. R.9E. R.10E. R.11E. R.12E. R.13E. R.14E. R.15E. R.16E. R.17E.
R.6E. R.6½E. R.7E. R.8E. R.9E.
T.10S. T.11S. T.12S. T.13S. T.14S. T.15S. T.16S. T.17S. T.18S. T.19S. T.20S. T.21S. T.22S. T.23S. T.24S. T.25S. T.26S. T.27S. T.28S.
MARION CO.
LINN CO.
LANE CO.
DESCHUTES CO.
JEFFERSON CO.
KLAMATH CO.
LAKE CO.
WILLAMETTE N.F.
DESCHUTES N.F.
FREMONT N.F.
MADRAS
SISTERS
REDMOND
BEND
LAPINE
CRESCENT
CHEMULT
CABIN LAKE R.S.
Mt. Jefferson
Three fingered Jack
Mt. Washington
Belknap Crater
Black Crater
North Sister
Middle Sister
South Sister
Broken Top
Sparks L.
Elk L.
Mud L.
Bachelor Bu.
Lava L.
Cultus L.
Crane Prairie Res.
Davis L.
Odell L.
Miller L.
Paulina L.
East L.
Paulina Pk.
Walker Mtn.
Bald Mtn.
Paulina Marsh
Silver Lake
Metolius River
Crooked River
Deschutes River